STAN-EVAL NOTES
CIVIL AIR PATROL VIRGINIA WING
UNITED STATES AIR FORCE AUXILIARY
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Density Altitude (thanks to Mike Schwartz of Aviation Adventures for this excellent description): It's August, it's summer, and it's hot! It's time to review density altitude. Aviation Adventures pilots regularly fly to destinations where aircraft performance can be seriously affected by the combination of high altitude and high temperatures. It is important for every pilot to understand the effects of aircraft operations in these conditions. Hot temperatures and high altitude can change a routine takeoff into an accident very quickly. Hot and high conditions present an inescapable influence over aircraft performance. There are three factors that affect air density.

1. Altitude - The higher the altitude, the less dense the air.
2. Temperature - The warmer the air, the less dense it is.
3. Humidity - The more humid it is, the less dense the air is.

Although humidity is a player in the density of air, it is generally not a factor in density altitude calculations. As a pilot taking off at high density altitudes, you can expect an increased takeoff distance, followed by a reduced rate of climb. You will experience higher true airspeeds on landing approach with the same indicated airspeed, resulting in an increased landing roll. High density altitude is a real hazard since it reduces aircraft performance in three ways:

1. It reduces power because the engine takes in less air to support combustion.
2. It reduces thrust because the propeller gets less grip on the thinner air and,
3. It reduces lift because the thinner air exerts less force on the airfoils.

When flying during the summer months, it is especially important to check the Pilot's Operating Handbook or Aircraft Flight Manual to determine expected performance. It is very possible that existing atmospheric conditions and the aircraft's gross weight could make a takeoff outright impossible or extremely dangerous. Density altitude can be easily calculated using mathematical formulae, various graphs, or an E6B. You can use an E-6B by using two factors, temperature and pressure altitude to come up with density altitude. If you haven't done this recently, maybe it's time to go see your flight instructor for a review. Pressure altitude can be determined by setting your kollsman window to 29.92". The altitude displayed will be pressure altitude. Pressure altitude is not really an altitude at all. It is air pressure as measured by the altimeter. We can also state that density altitude is not an altitude either as it is an index to aircraft performance.

Here's something for you to think about. What can you expect in August, departing Sky Bryce, (VG18), at 2:00 P.M.? For those that haven't been there before, the field elevation is 1263 feet MSL and the runway is 2,240 x 50 feet with trees and mountains all around. Let's make up some theoretical numbers to determine the density altitude. Temperature is 95 degrees, altimeter setting 29.70 resulting in a pressure altitude of 1483 feet and a density altitude of 4239 feet. That means your aircraft will perform as if at 4239 feet above sea level, not the actual elevation of Sky Bryce Airport. A quick check of the Cessna 172R POH shows that you will need nearly 3,000 feet to clear a 50 foot obstacle in these conditions. Not something I would want to attempt with only 2,240 feet of runway and trees off of each end.

One more example, Clearview Airport, (2W2), field elevation 799 and the runway is 1,840' x 30'. Same conditions as we used above. The pressure altitude is calculated to be 1019 feet and the density altitude is 3663 feet MSL. A quick check of the Cessna 172R POH, Chapter 5 Performance tells us that we will need approximately 2250 feet to clear a 50 foot obstacle at the end of the runway when utilizing short field take off techniques at a weight of 2450 pounds. That's about 400 feet more than we have available.

What this all means is you need to consider the summer temperatures and how they affect your aircraft performance requirements when selecting airports to visit. You might be able to land but not depart. Proper pre-flight planning will prevent this embarrassing situation from happening to you.

Rules of Thumb for Density Altitude: You can make a quick estimate of performance when temperatures are high by using the following rules of thumb. But remember, the POH is the best source:

- For each 10 degrees Fahrenheit above or below standard, add or subtract 600 feet to determine density altitude.
- Takeoff distance increases 12% for each 1,000' of altitude
- Rate of climb decreases 7% for every 1,000' of altitudes.

WMIRS AC Scheduling Tip: Viewing the WMIRS schedule showing aircraft scheduled can be a bit tricky as a flight late in the day that crosses the 0000Z boundary will show up both days. For example, if you schedule an aircraft for 2300Z to 0100Z on the 15th, the schedule will show the aircraft on both the 15th and the 16th. If you move the mouse over either day, it will show the time block 2300Z to 0100Z on both days which is misleading. It's only if you look at the detailed reservation that you can see that it really is only reserved for the evening of the 15th.

Doing VOR checks correctly (L. Randall): We all do the required 30 day VOR checks, right? Or we check the aircraft logs to make sure that it has been done. Wrong! Most of the CAP planes that I get into have not had a recent VOR check, and the ones that do are not logged correctly. Suppose you are in cruise and decide to tune both VORs into a station and look at the differences. You note that they are within 2 degrees of each other and determine the error is acceptable. So you log it as an airborne check with a two degree error. Is it really an airborne check? NO! It is a dual/differential check. To be an airborne check requires that you be over a published airborne check point. Most of us are not lucky enough to be at an airport with a VOT so we rely on other means of checking our systems. Remember, even though you are flying VFR, the next flight might be IFR and require the necessary check. Everyone should review the regulations to make sure that they are doing the correct entry. Each flight you should review the aircraft logs and if the check is not done then do it. Not that hard and worth the effort. Kind of like checking the tire pressure before each flight. We need to do a better job of that as well!

Alternate Static and Alternate Air: These are two terms you should be familiar with and understand for each aircraft you fly. They are excellent topics to review in preparation for a Form 5. They refer to two very different systems. An alternate static source refers to an alternate source of static pressure for the altimeter, airspeed indicator, and rate of climb indicator. It should be used if the primary static source becomes blocked for some reason (icing, clogged static port due to waxing of the a/c, or other cause). All of our Cessna aircraft have an alternate static source. Using an alternate static source usually means that the altimeter will read slightly higher than it should as the alternate source is in the cockpit which will have a slightly lower ambient pressure than the outside (and of course, we all know why?). Check your POH to see what correction factors should be applied to both altitude and airspeed. In a famous accident, a Boeing 757 was lost as all of the static ports were covered with tape for a wash and wax and not removed for flight. It was missed on preflight. As a result, the crew did not have reliable indications of either airspeed or altitude with fatal results.

Alternate air refers to a second source of air for the engine should the primary source become blocked (clogged air filter, induction icing, or a bird strike in the induction system). Our C172 and carbureted C182 aircraft do not have an alternate air system per se, but pulling the carb heat control provides an alternate source of air to the engine. Our fuel injected C182T aircraft have an alternate air system which will activate without pilot action. The C182T manual describes this as follows:

"CESSNA SECTION 7
MODEL 182T NAV III AIRPLANE AND SYSTEMS DESCRIPTION

AIR INDUCTION SYSTEM

The engine air induction system receives ram air through an intake on the lower front portion of the engine cowling. The intake is covered by an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an air box. The air box has one spring-loaded alternate air door. If the air induction filter should become blocked, suction created by the engine will open the door and draw unfiltered air from inside the lower cowl area. An open alternate air door will result in an approximate 10% power loss at full throttle. After passing through the air box, induction air enters a fuel lair control unit under the engine, and is then ducted to the engine cylinders through intake manifold tubes."

Approach and Landing Safety Tip (courtesy of the FAA): It sure would be a lot easier to avoid wake turbulence if we could see it! Unfortunately, as pilots we must rely on understanding the behavior and characteristics of wake turbulence to visualize and avoid it. Here are a few simple points to remember when landing behind a larger aircraft:

- Stay at or above the larger aircraft's final approach flight path.
- Note its touchdown point and land past that touchdown point.
- If you are unable to land safely beyond the touchdown point, go around.

Want to know a lot more about wake turbulence? Go to:
http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/list/AC%2090-23F/$FILE/AC90-23f.pdf

Airworthiness Considerations: We all know certain instruments and systems are required for safe flight. On every preflight, we make a determination as to whether the aircraft we are about to fly is airworthy. Part 91 Paragraph 205 specifies what equipment must be operable for safe flight. For example, in most GA airplanes if the attitude indicator is inoperable, it may still be safe and legal to fly day VFR. But if the compass is inoperable, Paragraph 205 prohibits flight until that instrument is repaired.

In addition to what Paragraph 205 requires, the POH may specify additional requirements. For example, all of our aircraft POHs specify certain placards must be installed. Without them, the aircraft is not airworthy (yes, there are numerous cases of aircraft falling out of the sky because a required placard was missing). The POH for our C182T aircraft have a KOEL (Kinds of Operation Equipment List) which specifies what instruments and systems are required for what type of flight (VFR, VFR Night, IFR). Pilots should be familiar with the KOEL and it is worth reviewing from time to time. It is especially important when something fails to determine if it is listed as required for flight.

Part 91 Paragraph 213 provides a useful methodology for determining if an aircraft is airworthy when something fails. Although most of this paragraph is concerned with Minimum Equipment Lists (which do not apply to VAWG aircraft), subparagraph (d) outlines how to determine airworthiness if there is inoperable instruments or equipment. Briefly, the methodology is:

The inoperative instruments and equipment are not—

(i) Part of the VFR-day type certification instruments and equipment prescribed in the applicable airworthiness regulations under which the aircraft was type certificated;

(ii) Indicated as required on the aircraft's equipment list, or on the Kinds of Operations Equipment List for the kind of flight operation being conducted;

(iii) Required by §91.205 or any other rule of this part for the specific kind of flight operation being conducted; or

(iv) Required to be operational by an airworthiness directive; and

And the inoperative instruments and equipment are—

(i) Removed from the aircraft, the cockpit control placarded, and the maintenance recorded in accordance with §43.9 of this chapter; or

(ii) Deactivated and placarded “Inoperative.” If deactivation of the inoperative instrument or equipment involves maintenance, it must be accomplished and recorded in accordance with part 43 of this chapter; and

And finally and most importantly a determination is made by a pilot, who is certificated and appropriately rated, or by a person, who is certificated and appropriately rated to perform maintenance on the aircraft, that the inoperative instrument or equipment does not constitute a hazard to the aircraft.

More on Stall Recoveries: There were some interesting discussions on Flying Lessons Weekly which explained why you should NOT use ailerons during a stall recovery. Although our Cessna fleet is very well mannered, using ailerons to level the wings during a stall can lead to an unusual attitude in many aircraft. Because our Cessna fleet has washout at the wingtips, the ailerons are effective in all but the most aggressive stalls. Nevertheless, instructor pilots should ensure that our pilots only use rudder during a stall. The reason for this is basic aerodynamics. If you have a wing low during a stall, applying aileron to raise the wing only increases the angle of attack on the stalled wing which in turn causes the wing to stall more aggressively. What this means is that the airplane may roll into the lowered wing which is exactly opposite of what was intended. Applying rudder to lift the wing is the correct technique. Once the stall is broken, use of the aileron is fine.

Articles for the VAWG Stan Eval Newsletter: We are always looking for brief articles of interest to VAWG pilots to include in this newsletter. CAP has many very experienced pilots who have useful techniques, experiences, and tips to share. Please send your contribution to steve.hertz@ngc.com. If your article is accepted, you will get a pro rata share of the VAWG Stan Eval Newsletter subscription fees.